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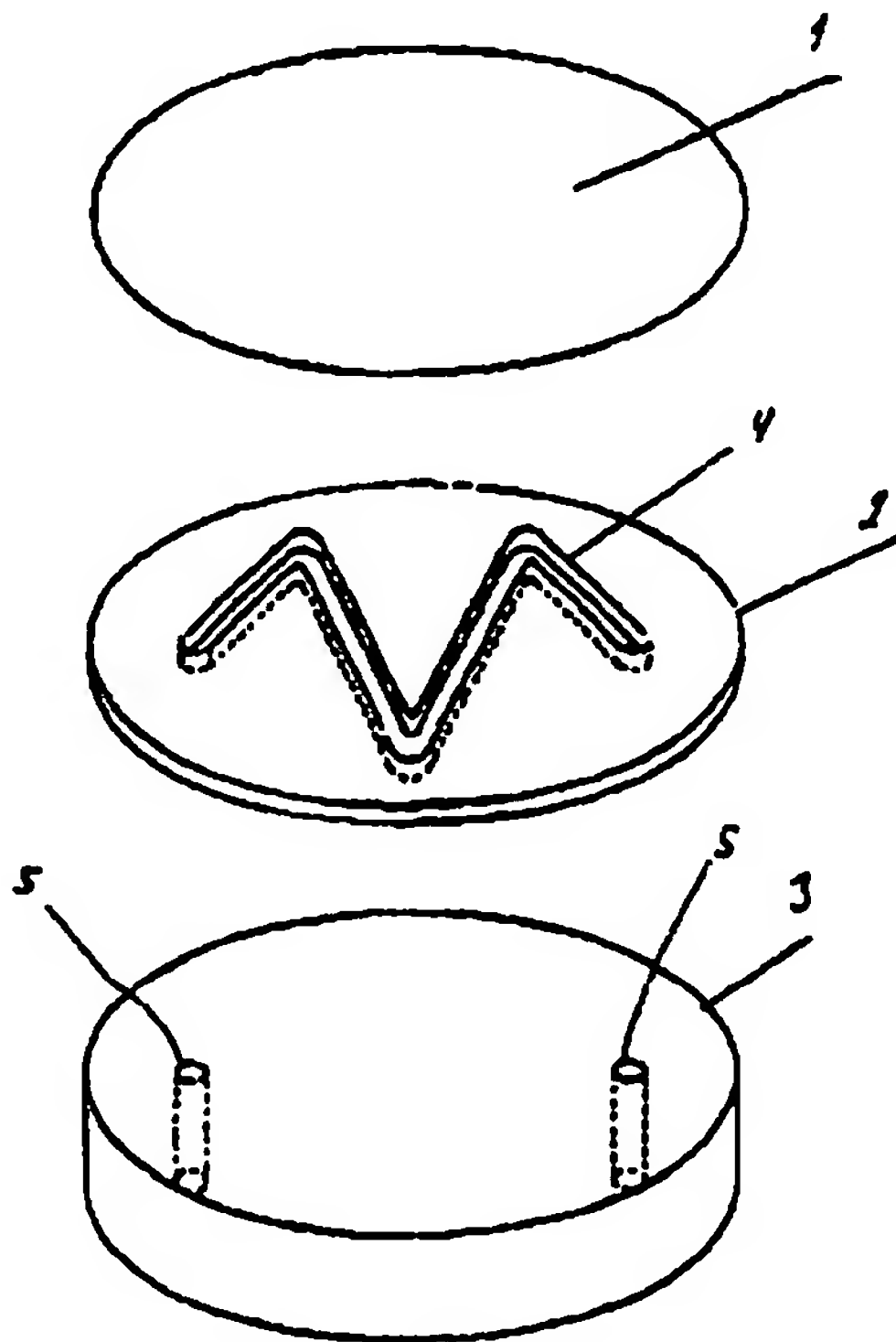
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(54) Title: SAMPLING MEANS FOR A CHEMICAL ANALYSIS APPARATUS

## (57) Abstract

A sampling means of a chemical analysis apparatus includes a membrane, which is attached to a membrane carrier, which has an inlet passage to the side of the carrier facing the membrane and a discharge passage going therefrom. The passages conduct the medium to be measured and which medium absorbs ions, molecules or particles which pierce the membrane. In order to provide a sampling means, which has a short reaction time and makes use of small amounts of the medium to be measured and is easy to manufacture, the mouths of the inlet passage and of the discharge passage, which opens to the membrane, are interconnected by means of at least one groove, which is open towards the membrane. The groove is formed in a surface layer, which is attached between the membrane and the membrane carrier or is manufactured on the surface of the membrane carrier. The open side of the groove is closed by the membrane by that the membrane adheres to the surface layer or to the surface of the carrier facing the membrane.



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## **SAMPLING MEANS FOR A CHEMICAL ANALYSIS APPARATUS**

This invention refers to a sampling means for a chemical analysis apparatus, which means includes a membrane, which is attached to a membrane carrier, which has an inlet passage to the side of the carrier facing the membrane and a discharge passage going therefrom, which passages conduct the medium to be measured. The medium absorbs ions, molecules or particles, which pass through the membrane.

AT 355 546 discloses a known dialysis system of the mentioned art. The dialysis membrane is thereby attached to the outside of a curved membrane carrier. A number of grooves are formed in the upper side of the membrane carrier. A medium to be measured flows through the passages and ions from the surrounding medium pierce the dialysis membrane into the medium to be measured, which thereafter is sent to a chemical analysis apparatus.

The object of the invention according to this application is to provide a sampling means, which has a short reaction time and makes use of small amounts of medium to be measured. Said object is achieved by that the means has the characterizing features stated in enclosed claims.

The sampling means according to the invention forms a small test volume under the membrane where the test volume has a large exposable upper surface facing the membrane. Thus according to the invention, the depth of the groove is decided in a special way and this means that this parameter is easy to decide. Also the width of the groove can be determined exactly during the production. The adhesive, which must be used for attaching the membrane to the membrane carrier, may be used for forming the groove, which conducts the medium to be measured. The adhesive may be applied to the membrane carrier or to the membrane in such a way that areas are formed, which are kept free from adhesive and these areas

are connected with each other so that an open path is formed. The surface layer of adhesive can alternatively be applied between two layers of tape. This makes it possible to work the surface layer by water jet cutting or by punching in the same way as can be used to form a groove in an adhesive double layer tape.

According to another embodiment of the invention the surface layer can be formed by a ceramic disk and because the ceramic disk is porous there will be a flow path for the medium to be measured between the inlet end the discharge opening. A large contact surface will automatically be formed facing the membrane because the medium to be measured will flow relatively freely in the pin-holes of the ceramic.

In a further embodiment the groove is formed in a surface layer e.g. a metal sheet and the groove is thus formed by punching, laser cutting, water jet cutting or etching of the metal layer.

The metal sheet or a sheet of different material can be applied to the membrane carrier by means of an adhesive or the membrane can be clamped on the metal sheet and kept to the outside of the membrane carrier. This means that the sampling means can be made simply and cheaply. If the sheet is made from plastic the groove or grooves can be formed by punching or by water jet cutting. Laser cutting may also be possible. By using plastic for the sheet it is avoided that ions are emitted to the medium to be measured, which a metal might do and if so the measurement would be deteriorated or destroyed in certain applications.

It is further suggested that the sheet is made from double-sided adhesive tape. A simple attachment to the membrane carrier and to a membrane is hereby achieved. The double-sided adhesive tape may have a protecting tape over the layer of adhesive and a groove can then preferably be formed by

water jet cutting, which gives a large freedom in forming the groove. When the groove is formed in the sheet by etching there is also a large freedom concerning the shape of the groove. Different types of membranes are used for different purposes. Thus, it is possible to use the membrane as a filter or one can use different pressures on the sides of the membrane for a reversed osmosis. The membranes may as well be used without a pressure difference for dialysis where ions pierce the membrane and an equalization of the concentration of ions take place on both sides of the membrane.

There are also other possibilities to carry out the invention and one possibility is to weld the membrane directly on the carrier in a pattern so that the grooves appear as gaps between the welding seams. A further possibility is to form the grooves on the membrane carrier and that the membrane is attached by adhesive or by welding direct on the membrane carrier.

The sampling means according to the invention can be used in chemical analysis apparatuses, which are used for medical measurements. The sampling means is as well useful for measuring in the production in chemical industries. The invention can also be used when measuring the concentration of ions in waste water.

A best embodiment of the invention among several ones will be described in the following with reference to enclosed drawing.

The drawing shows a membrane 1 and its characteristics decide the size or the chemical composition of particles, molecules or ions, which can pierce the membrane. A sheet 2 having a through cut groove 4 is attached to the under side of the membrane 1. The sheet can be made from metal, plastic or adhesive and the groove can be produced by punching, etching, laser cutting or water jet cutting. The groove is shown in a

certain zigzag pattern but the form of the groove may be varied depending on the wanted length of the groove, the size of the areas etc. A membrane carrier 3 is shown under the sheet 2 in the figure. The membrane carrier has an inlet passage 5 and a discharge passage 5'. The mouth of the passage 5 is connected with the left end of the groove 4 and the mouth of the passage 5' is connected with the right end of the groove. A flow pass is hereby established by the inlet passage 5, the groove 4 and the discharge passage 5'.

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The membrane 1, the sheet 2 and the membrane carrier 3 are preferably glued together. The adhesive is applied on the sheet 2 before the groove 4 is formed, whereby the groove safely is free from adhesive. As said above the sheet 2 may be double-sided adhesive tape or adhesive, where the adhering surfaces are protected by a protecting tape when being prepared.

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As also said above the groove 4 may have different configurations depending on the real use. There may also be several different grooves 4 under the same membrane and being connected to the inlet passage 5 and discharge passage 5'.

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**CLAIMS**

1. Sampling means of a chemical analysis apparatus, which means includes a membrane, which is attached to a membrane carrier, which has an inlet passage to the side of the carrier facing the membrane and a discharge passage going therefrom, which passages conduct the medium to be measured and which medium absorbs ions, molecules or particles which pierce the membrane, characterized in that the mouths of the inlet passage and of the discharge passage which opens to the membrane are interconnected by means of at least one groove which is open towards the membrane and which groove is manufactured in a surface layer, which is attached between the membrane and the membrane carrier or which groove is manufactured on the surface of the membrane carrier, the open side of the groove being closed by the membrane in that the membrane adheres to the surface layer or to the surface of the carrier facing the membrane.
2. Means according to claim 1, characterized in that the membrane, the surface layer and the carrier includes plain surfaces which contact each other.
3. Means according to claim 2, characterized in that the surface layer consists of an adhesive, in which at least one groove is formed.
4. Means according to claim 2, characterized in that the surface layer is of ceramic, where the groove is constituted by the pin-holes of the chosen ceramic.
5. Means according to claim 1 or 2, characterized in that the surface layer consists of a sheet.
6. Means according to claim 5, characterized in that the sheet is made from metal.

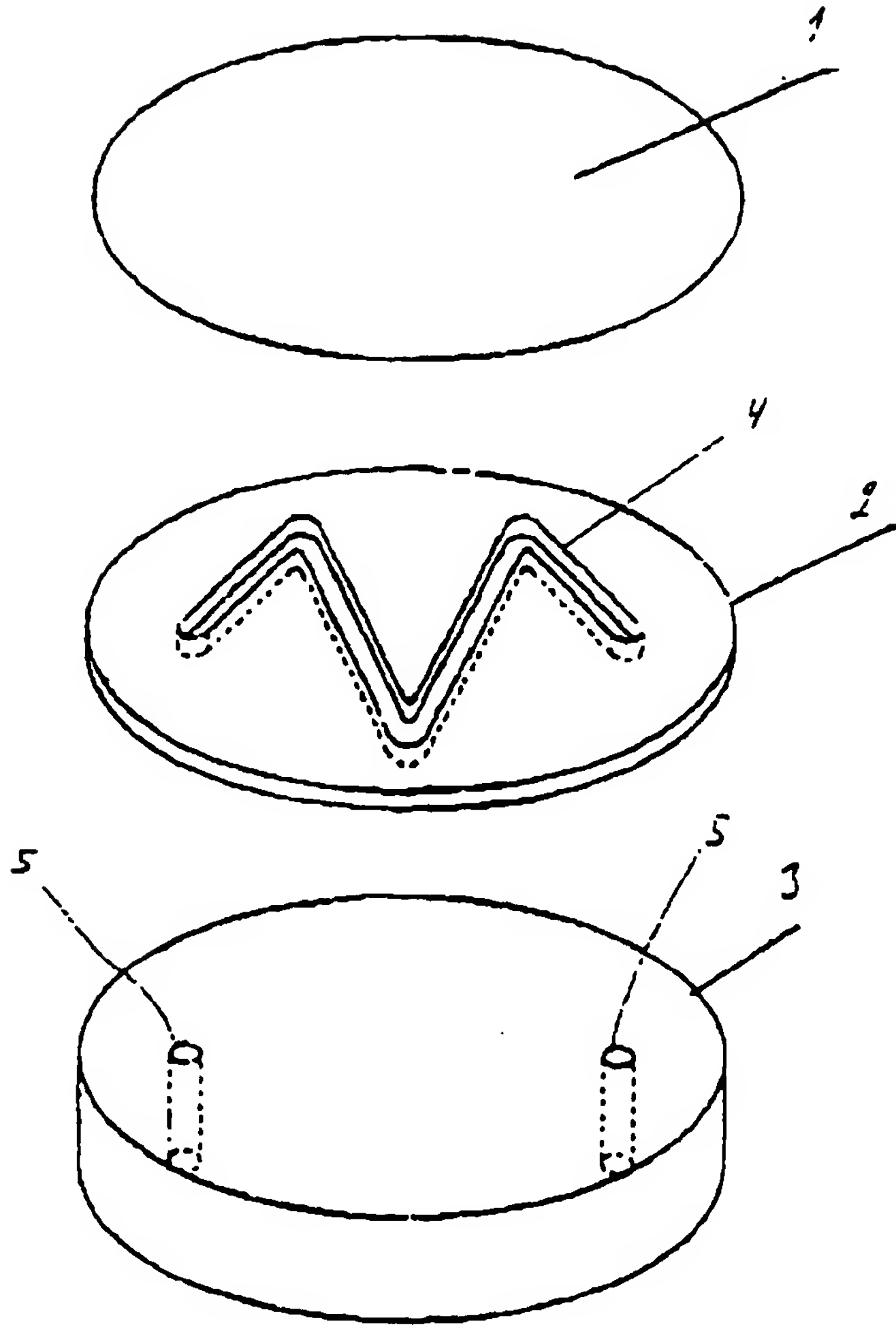
7. Means according to claim 6, characterized in that the sheet is made from plastic.

5 8. Means according to claim 5, 6 or 7, characterized in that the sheet is covered by an adhering material on both sides.

10 9. Means according to claim 1, characterized in that the surface layer consists of a fluid lining, which is applied on the carrier and which is hardened and adheres to the carrier.



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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 95/00354

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: G01N 1/10

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: G01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Patent Abstracts of Japan, Vol 9, No 24, P-331, abstract of JP, A, 59-170742 (MITSUI TOATSU KAGAKU K.K.), 27 Sept 1984 (27.09.84) --	1,2
X	FR 1573147 A (LEEDS & NORTHRUP COMPANY), 27 May 1969 (27.05.69), page 5, column 1, line 21 - column 2, line 11 --	1,2
A	EP 0107631 A2 (BIFOK AB ET AL), 2 May 1984 (02.05.84), page 5, line 20 - page 6, line 20 --	1



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(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 8100911 A1 (THE PRINCE CHARLES HOSPITAL DEVELOPMENT CENTRE TRUST), 2 April 1981 (02.04.81), page 14, line 21 - page 15, line 2  --	1
P,A	WO 9425875 A1 (DANFOSS A/S ET AL), 10 November 1994 (10.11.94), page 14, line 23 - page 17, line 8  -- -----	1

## INTERNATIONAL SEARCH REPORT

Information on patent family members

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			AU-B,B-	522965	01/07/82
			AU-A-	6393680	14/04/81
			EP-A-	0036000	23/09/81
WO-A1-	9425875	10/11/94	NONE		